

<b>Notice of Allowability</b>	<b>Application No.</b>	<b>Applicant(s)</b>	
	10/622,121	CHOI ET AL.	
	<b>Examiner</b>	<b>Art Unit</b>	
	Julian D. Huffman	2853	

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--**

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☐ This communication is responsive to \_\_\_\_\_.
2. ☒ The allowed claim(s) is/are 1-18.
3. ☒ The drawings filed on 18 July 2004 are accepted by the Examiner.
4. ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
  - a) ☒ All    b) ☐ Some\*    c) ☐ None    of the:
    1. ☒ Certified copies of the priority documents have been received.
    2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
    3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).
  - \* Certified copies not received: \_\_\_\_\_.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.  
**THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.**

5. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
6. ☐ CORRECTED DRAWINGS ( as "replacement sheets") must be submitted.
  - (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review ( PTO-948) attached
    - 1) ☐ hereto or 2) ☐ to Paper No./Mail Date \_\_\_\_\_.
  - (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date \_\_\_\_\_.

**Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).**
7. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

**Attachment(s)**

- |   |  |
|---|--|
| 1. <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)   | 5. <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)            |
| 2. <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                | 6. <input type="checkbox"/> Interview Summary (PTO-413),<br>Paper No./Mail Date _____. |
| 3. <input type="checkbox"/> Information Disclosure Statements (PTO-1449 or PTO/SB/08),<br>Paper No./Mail Date _____ | 7. <input type="checkbox"/> Examiner's Amendment/Comment                               |
| 4. <input type="checkbox"/> Examiner's Comment Regarding Requirement for Deposit<br>of Biological Material          | 8. <input checked="" type="checkbox"/> Examiner's Statement of Reasons for Allowance   |
|   | 9. <input type="checkbox"/> Other _____.   |

***Reasons for Allowance***

The following is an examiner's statement of reasons for allowance.

It is known in the art to count the number of droplets discharged, or to provide various detectors in the ink cartridge to determine amount of ink remaining.

U.S. 4,550,327 to Miyakawa discloses detecting the change in current of a heater to determine the state of liquid in the nozzle. Each chamber has a heater 11 and detecting resistor 12.

Miyakawa does not detect amount of ink discharged and also does not have a detector connected to the heaters which outputs a state change signal. In Miyakawa, each heater has its own detector, while in applicant's invention, one state detecting resistor is provided for all heaters.

U.S. 5,617,121 to Tachihara et al. discloses a heater circuit for a nozzle which has a current detecting resistor, fig. 11, which detects a current related to the heating element. If no ink is present in the ink chamber, the detector sends a signal to comparator which informs controller that no ink is present. This result, coupled with a ink level sensor provided in the reservoir of the ink tank, enables the device to completely use all ink present in the chamber and reliably detect when no ink remains.

Tachihara et al. can potentially detect that no ink has been discharged, and can therefore meet the limitation of a detector detecting an amount of ink discharged, but Tachihara et al. provide each heater with a detector detecting the state change, while applicant's invention claims a detector connected to the heaters that detects a state

change of the heaters. The detector of Tachihara is not detected to plural heaters, since its connection is separated by the driving transistors which enable each heater to be individually controlled.

U.S. 5,929,875 to Su et al. disclose a microphone type detector for acoustically monitoring the response of fluid ejectors and determining characteristics therefrom. the device is provided remote from the printhead.

None of the above references reduce the amount of ink discharged during maintenance.

U.S. 5,856,834 to Murphy, III discloses reducing amount of ink discharged during maintenance based on a detected ink level. Murphy, III use a drop counter. It would not be possible to modify the Tachihara et al. and Miyakawa references to incorporate the reduction of discharge amount during maintenance taught by Murphy, III, since these references can only detect when no ink is present in the chamber and when ink is completely depleted. When such a condition is reached, discharge amount reduction during maintenance cannot be performed. More specifically, maintenance cannot be performed since no ink remains to be ejected and thus no reduction in ejection can be performed.

With regards to claims 1 and 7, the most pertinent prior art reference, Tachihara et al., does not disclose a detector connected to plural heaters that detects a state change of the heaters and outputs a state change signal. Further, the prior art does not teach this limitation in combination with an ink discharge amount calculator that

calculates an amount of discharged ink corresponding to the state change output signal from the detector.

Additionally, with regards to claim 7, though it is known to reduce amount of discharged ink during maintenance based on ink level, the prior art of record does not teach the claimed apparatus for detecting the ink level.

With regards to claims 13-17, the prior art of record does not disclose cumulating each amount of discharged ink. Tachihara et al. is capable of detecting when no ink remains in the channel based on the output from a current detecting resistor and therefore can determine that no ink has been discharged, however, Tachihara et al. do not then cumulate an amount of discharged ink based on the detected result from each of the heaters. The primary detector of Tachihara et al. is the detector inside the ink reservoir which does not detect a state change of the heaters. The current detecting resistor is then used to determine when all of the ink has been depleted in the channels.

Additionally, with regards to claim 15, though it is known to reduce amount of discharged ink during maintenance based on ink level, the prior art of record does not teach the claimed method for detecting the ink level.

Claim 18 claims that a current detecting sensor is connected between a power supply and a nozzle heating unit, which has a plurality of heaters, and detects changes in current flowing through the heaters and outputs a state change signal. In the prior art, plural current detecting sensors are provided, one for each heater, and no one sensor is connected to a nozzle heating unit which has a plurality of heaters.

It is noted that applicant's use of the term "state change" is not equivalent to prior art counters, such as that disclosed in U.S. 6,631,972 which increment a counter when a driving signal has been sent to a nozzle. The mere occurrence of sending a driving signal to a nozzle does not imply that it has been driven by the driving signal and undergone a state change. Various factors such as bubbles, failed heaters, etc. can cause ejection to fail despite application of a driving signal, as applicant discusses in the disclosure.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Julian D. Huffman whose telephone number is (571)272-2147. The examiner can generally be reached Monday through Friday from 9:00 a.m. to 5:30 p.m.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Stephen Meier, can be reached at (571) 272-2149. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Art Unit: 2853

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.



JH

September 25, 2004



**Tinh Nguyen**  
**Primary Examiner**  
**Technology Center 2800**